STEEL FABRICATION SHOP MATERIALS INSPECTION

GENERAL

Acceptance of materials relating to structural steel fabrication is based on producer or supplier certifications, or by acceptable test results of samples obtained by a representative of the Iowa DOT. Sample arrangements and locations will be determined after copies of fabricator purchase orders for all materials required (except structural steel) have been received by the Iowa DOT Office of Materials.

The basis of acceptance of foreign products and materials is to be referred to the Materials Engineer.

Listed below are the inspection requirements and the basis of acceptance of various materials used in structural steel fabrication. For acceptance procedures of items not listed below, contact the Iowa DOT Office of Materials.

A. Structural Steel

1. Grades of steel

ASTM A709/A709M

No Charpy	Non-Fracture Critical Charpy	Fracture Critical Charpy
36(250)	36T(250T)	36F(250F)
50(345)	50T(345T)	50F(345F)
50W(345W)	50WT(345WT)	50WF(345WF)
70W(485W)	70WT(485WT)	70WF(70WF)
100(690)	100T(690T)	100F(690F)
100W(690W)	100WT(690WT)	100WF(690WF)

W signifies weathering.

Other steels may be used as required by the contract documents or approved by the engineer.

2. Basis of acceptance of structural steel

Structural steel will be accepted on the basis of Mill Test Certifications and physical inspection at the fabrication site. Mill Test Reports need not be notarized, but must bear the name of a responsible representative of the company.

The shop inspector shall be given Mill Test Certifications in triplicate at the earliest possible date prior to the fit-up stage of bridge fabrication. Upon receipt of the Mill Test Certifications, the inspector will check the physical and chemical test results to determine compliance with the designated grade of steel. Charpy test results shall be actual figures of individual test. When compliance has been determined, the inspector will date and initial the certifications.

Certification of compliance from a steel supplier in lieu of a Mill Test Certification is acceptable providing actual test values are shown and a responsible representative of the supplier signs the certification.

3. Physical inspection of structural steel by the inspector at the fabrication plant

a. Dimensions

Thickness of flange plates, cover plates, web plates and webs and flanges of rolled beams shall be measured to the nearest .025 mm (.001 inch).

Width of flange plates, cover plates and the flanges of rolled beams shall be measured to the nearest 1/16 inch (1.6 mm).

Depth of rolled beams and welded girders shall be measured to the nearest 1/16 inch (1.6 mm).

Thickness and width of structural steel used as main members except those listed above shall be measured to the nearest 1.6 mm (1/16 inch).

b. Determining mass compliance of rolled beams

Shop inspection to determine the mass of rolled beams shall be by the following method:

1. Measure the flange thickness and record the average flange thickness

2. Measure the web thickness and record the measurement

3. Add the theoretical thickness of one flange and the web (as given in the Steel Construction Manual)

4. Add the actual (average) measured thickness of the web and the actual (average) thickness of the flange measurements.

5. Subtract the "actual measured" total from the theoretical total.

6. Divide this difference by the theoretical total and multiply by 100 to secure percent underweight (the specified mass tolerance is minus 2.5 percent).

The Office of Materials Field Engineer should be contacted when formula indicates beam is outside of tolerance. Location of the beam in the structure will be a factor in determining status of beam, which is outside of allowable tolerance. Actual weighing of beam may be required.

c. Mill rolling or handling defects

Laminations - edges, longitudinal, and transfers. (See AWS D1.5 Specifications for limitations and method of repair.) Contact the Field Engineer for the final disposition of laminations.

Other defects - (rolled in foreign material) surface scabs, fins. Determine the approximate width and depth of defective area. Contact the Field Engineer for instructions for repair.

Other defects – waviness, sweep, kings, and gags. Determine the extent of the defective area. When outside allowable tolerance, corrective action will be required in accordance with I.M. 563, Section IV. Straightening of Materials.

d. Flame cutting defects. (See I.M. 563.)

e. Heat correcting of steel. (See I.M. 563.)

B. Swedge Bolts and Tie Rods

1. Bolt acceptance

Steel for tie rods shall be ASTM A-36 or other approved grade. Steel for swedge bolts shall be ASTM F1554 Grade 36. Steel for swedge bolts and tie rods shall be accepted by Mill Test report.

2. Nuts and washers

Nuts shall meet the requirements of ASTM A-563 DH (Heavy Hex). Washers shall meet the requirements of ASTM F-436.

3. Shop inspection of swedge bolts and tie rods

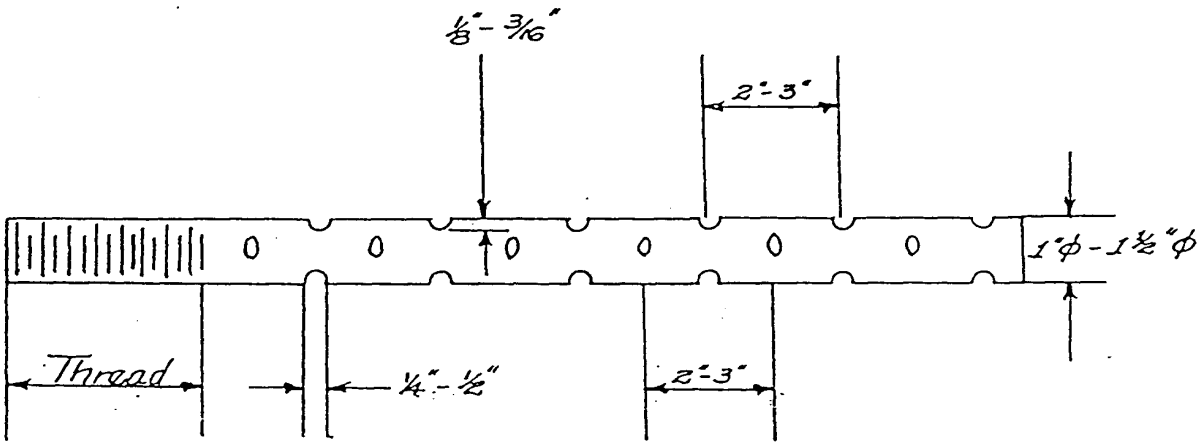
a. Dimensions

1. Diameter

2. Length

3. Thread length

4. Deformations (swedge bolts)



TYPICAL SWEDGE ANCHOR BOLT

C. Shear Studs (AWS D1.5 Stud Welding)

1. Acceptance

Acceptance of shear studs is based on Mill Test Certification showing actual results of tests conducted not more than six months prior to the date of manufacture of the studs. Approved sources are listed in I.M. 453.10, Appendix A.

D. Castings

1. Steel and iron (Standard Specifications, Sections 4153.03 and 4153.04)

A sample of each heat shall be submitted to the Iowa DOT for testing. The identification form accompanying the sample shall have shown:

a. Pour date

b. Heat number

c. Casting type grade

d. Quantity of pieces

Each casting shall be marked with heat number for identification. Castings shall be visually inspected for pouring deficiencies or damage in accordance with I.M. 563, Section VI. Machining Inspection.

2. Bronze castings (Standard Specifications, Section 4190.03)

Approval of bronze bearing plates is based on the correlation of test bars submitted to the Iowa DOT by the supplier and the test results of the manufactured plates sampled at the fabricator's plant by the Iowa DOT inspector. One plate shall be submitted for testing representing each heat from which castings were poured. A manufacturer's certification showing actual test results in also required.

Inspection of dimensions, inserts and finish shall be conducted on the samples submitted to the Iowa DOT.

E. Pins and Rollers (Standard Specifications, Section 4153.02)

1. Cold drawn steel

Cold drawn steel for pins and rollers is accepted by Mill Test Certification providing that in addition to the chemical analysis, either the hardness or tensile strength is recorded. If this information is not shown on the certification, a test sample is required.

2. Forged pins or rollers (Standard Specifications, Section 4153.01)

F. Bolts, Nuts and Washers (Standard Specifications, Section 4153.06)

Approval of bolts, nuts and washers is based on test results of samples selected and submitted to the Iowa DOT Laboratory by a representative of the DOT. High strength bolts, nuts and washers shall be marked as prescribed in ASTM A-325. The sampling frequency shall be as listed in I.M. 453.06B. The sampling frequency for ASTM A-307 bolts, nuts and washers of each diameter and length represented) shall be as follows:

1. One (1) sample per 800 pieces

2. Two (2) samples per 801 - 8000 pieces

3. Three (3) samples per 8001 – 22,000 pieces

4. Five (5) samples per 22000 and over

G. Paint (Standard Specifications, Articles 2508, 4182)

All painting of structural steel shall be inspected in accordance with I.M. 567, Zinc-Silicate Painting Inspection Manual, and the paint shall be inspected and accepted in accordance with I.M. 482.02, Inspection and Acceptance of Paints for the Zinc-Silicate Painting System.

When special paints are required, acceptance will be as per Iowa DOT Laboratory instructions.

H. Electrodes and Flux (I.M. 559)

Acceptance is based on a list of approved brands for which satisfactory test reports have been made within the last year by the manufacturer. Random filler metal tests may be required to substantiate manufacturer test results. The Central Materials Office issues a list of approved brands of electrodes every six months.

I. Galvanized Material (Standard Specifications, Section 4100.07)

An electromagnetic thickness gauge either at the fabricating plant or at the job site shall inspect galvanizing thickness. Galvanized hardware shall be sampled and submitted to the Iowa DOT Laboratory for testing.

J. Aluminum Handrail and Hardware (Standard Specifications, Section 2414.06)

Acceptance is based on certification checked and approved by the Iowa DOT Laboratory, Ames, Iowa.

K. Anchor Bolts

All high strength anchor bolts, shall be accepted on the basis of sampling and testing and Mill Test Report.